(54) Title: PREPAID SERVICE IN A PACKET-SWITCHED MOBILE COMMUNICATION NETWORK
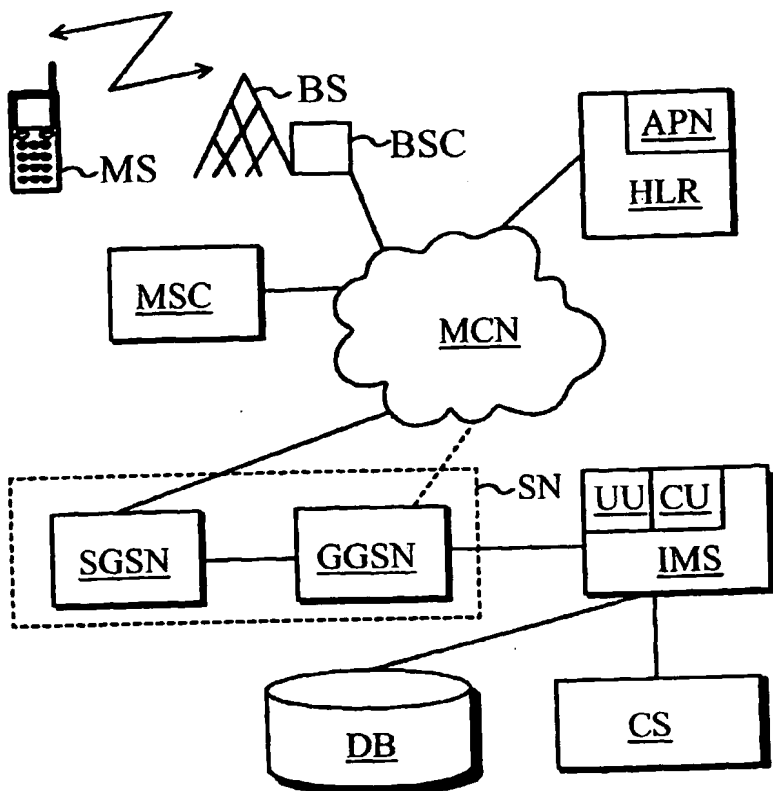
(57) Abstract: The invention relates to a method and system for implementing a prepaid service in a packet-switched mobile communication network, in which method the mobile station (MS) is delivered the information requested by it as long as there is prepaid balance left. In the method, an access point name definition (APN) is defined that points to the service node (SN) via which it is possible to use the prepaid service; a control server (IMS) is used to monitor the traffic between the mobile station (MS) and the content server (CS) after there was the access point name definition (APN) mentioned in the activation request of data service sent from the mobile station (MS), which monitoring proceeds as long as the aforementioned data service is active, and the prepaid service balance in the billing database (DB) is updated for the use of the data service based on the monitoring of the control service (IMS).

WO 02/15554 A1

CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

PREPAID SERVICE IN A PACKET-SWITCHED MOBILE COMMUNICATION NETWORK

The invention relates to telecommunication systems. In particular, the invention relates to a system in which a prepaid service is implemented in a

5 general packet radio service (GPRS, General Packet Radio Service). In a prepaid service, the client first deposits currency into the account of the service provider that the client may use while utilizing the service provided by the service provider.

10

PRIOR ART

With the popularity of the global system for mobile communication (GSM, Global System for Mobile Communication), more and more new systems are being

15 developed for the digital communication. The central components of the global system for mobile communication are the mobile station, which is identified in the telecommunication network by means of a subscriber identity module, and the base station, which estab-

20 lishes a telecommunication connection with the mobile station by a radio path, and determines a cell area within which the mobile station may move without a handover. Several cell areas form the telecommunication network system. The roaming of a mobile station

25 is used to mean the visit of a mobile station in the area of a telecommunication system of another operator. The subscriber information of the mobile communication system is saved in the home location register (HLR, Home Location Register). In the future, the

30 global system for mobile communication system is possibly going to change into a universal mobile telecommunications system (UMTS, Universal Mobile Telecommunications System).

One known technique is the general packet ra-

35 dio service in which information in a digital packet form is transferred. The packet-switched radio service

has been standardized by the European Telecommunications Standards Institute (ETSI, European Telecommunications Standards Institute). The packet-switched radio service enables one to flexibly transfer information to end users by packet-switched protocols, examples of which are e.g. the Internet protocol (IP, Internet Protocol) and X.25. Typically, the packet-switched radio service is used to efficiently transfer information because it enables one to define one to eight time slots for data transfer.

For implementing the packet-switched radio service in the global system for mobile communication, two new network nodes are needed, among other things. The serving GPRS support node (SGSN, Serving GPRS Support Node) monitors the locations of separate mobile stations and implements security operations and access control. The gateway GPRS support node (GGSN, Gateway GPRS Support Node) connected to the serving GPRS support node implements the telecommunication connection to external packet-switched telecommunication networks. In addition, for the packet-switched radio service one needs the registration of the subscribers belonging to the access network in the home location register.

To bring Internet services into wireless mobile stations, a wireless application protocol (WAP, Wireless Application Protocol) has been developed. The protocol enables one to define the connection setup from a mobile station to the Internet, which allows one to access the World Wide Web browser program, e-mail program and other Internet applications using the mobile station. Also other so-called micro browser programs are known, examples of which are e.g. Imode over GPRS and Compact HTML over GPRS.

Previously known is a solution for the enhancement of customized applications in a mobile network (CAMEL, Customized Applications for Mobile net-

work Enhanced). With the solution, the operator may implement services to a subscriber of its own network visiting the telecommunication network of another operator. The CAMEL has been presented e.g. in the standard TS 22.078 V.3.2.0 (1999-12) of the 3rd generation partnership project (3GPP, 3rd Generation Partnership Project).

Further, previously known is the implementation of services in telecommunication networks by means of so-called intelligent networks. An intelligent network (IN, Intelligent Network) is a telephone network system in which the logic needed for the implementation of the services has been placed in a separate unit, which is not necessarily located in the telephone exchange. In that case, it is possible to advantageously develop the services without having to re-plan the central equipment. The system comprises several nodes, of which let it be mentioned the service control point (SCP, Service Control Point).

A typical service used in an intelligent network is a prepaid service. In the service, the subscriber first deposits a certain amount of currency into the account of the service provider, after which the subscriber may use the service. The subscriber is debited for using the service, in which case the service provider deducts the amount of currency in the account. If there is no currency in the account of the subscriber, then s(he) cannot use the service. Only when the subscriber has deposited more currency into the account, e.g. via a telephone number liable to charge, s(he) can re-call the service. Often as the criteria of debiting, a billing based on time or amount of information transferred is used.

Instead of using an account, also credits may be used. In that case, the subscriber buys from the operator connection time on credit, of which a set of credits and an entry in the database of the service

provider are saved. The value of one credit may be
e.g. one minute of connection time. When the client
uses the service, the credits saved to the database
are deducted according to some suitable debiting cri-

5 terion.

One specific problem is becoming the imple-
mentation of the prepaid service in a packet-switched
radio service network. The implementation of the serv-
ice requires the implementation of circuit-switched

10 components in a packet-switched radio service network,
which is costly and cumbersome.

Previously known is a solution in which a
debiting service is implemented in the mobile communi-
cation network by enhancement of customized applica-

15 tions (CAMEL). The solution requires that to the serv-
ing GPRS support node (SGSN), the interface of the in-
telligent network is added that is able to communicate
with the service control point of the intelligent net-
work (SCP, Service Control Point). The solution is,

20 however, complicated as compared to the sending of
messages presented by the invention, as well as to the
adding of one essential component. At present, not a
single device manufacturer has implementations of the
packet-switched radio service network of first phase

25 supporting the CAMEL solution. Furthermore, in the
roaming situation of a mobile station the CAMEL solu-
tion would require that the serving GPRS support node
(SGSN) of each operator belonging to the roaming con-
tract of the mobile station would support the CAMEL

30 functionality in question. For the time being, it
seems that this will not happen very fast.

Fig. 1 represents one prior-art signaling
diagram. The diagram illustrates the transmission of
messages between the components of the telecommunica-

35 tion network MCN. The components of the figure are a
mobile station MS, serving GPRS support node SGSN and
gateway GPRS support node GGSN. At first, the mobile

station MS sends a request for service activation to the serving GPRS support node SGSN, which checks the authenticity of the information of the mobile station MS by security operations. Next, a request for tele-

5   communication connection setup is sent from the serving GPRS support node SGSN to the gateway GPRS support node GGSN. When the telecommunication connection has been set up, a message informing thereof is sent to the serving GPRS support node SGSN, from which a re-

10   sponse is further transmitted to the mobile station MS.

OBJECTIVE OF THE INVENTION

     The objective of the present invention is to

15   eliminate or alleviate the problems referred to above. One further objective of the invention is to enable a considerably simple method for the implementation of a prepaid service in a general packet radio system.

BRIEF DESCRIPTION OF THE INVENTION

20

     The invention enables one to implement a billing system of a digital service by monitoring the telecommunication connection between the mobile station and the content server implementing the service.

25   Information of the use of the service is gathered on a control server located in the telecommunication network, from which the information is further transferred to the billing database.

     The invention relates to a method in which

30   the prepaid service is implemented in a packet-switched mobile network. In the method, the mobile station is delivered the information requested by it, in accordance with the service, as long as there is prepaid balance left in the database. At first, in the

35   method there is defined an access point name definition which points to the service node via which the

prepaid service is used. Further in the method, the traffic between the mobile station and the content server is monitored by means of the control server after there was the access point definition mentioned in
5   the activation request of the data service sent from the mobile station. The monitoring proceeds as long as the aforementioned data service is active. Finally in the method, the prepaid service balance in the billing database is updated for the use of the data service
10   based on the monitoring of the control server.

In one embodiment of the invention, the access point definition is placed in the home location register. In another embodiment of the invention, prior to the monitoring of the traffic between the mo-
15   bile station and the content server, the balance of the prepaid service is checked from the billing database and the use of the prepaid service is barred, if the prepaid balance in the billing database is not sufficient for using the service.

20   In one embodiment of the invention, during monitoring the traffic between the mobile station and the content server, the balance of the prepaid service is checked from the billing database and the use of the prepaid service is barred, if the balance in the
25   billing database is not sufficient for using the service.

In one embodiment of the invention, the use of the prepaid service is barred by stopping the transmitting of the packets to be sent to the mobile
30   station.

In one embodiment of the invention, the use of the prepaid service is barred by sending a message to the gateway GPRS support node.

In one embodiment of the invention, the billing database is updated by attributing the follow-up
35   information based on the subscriber number (MSISDN).

In one embodiment of the invention, the billing database is updated by attributing the follow-up information based on the subscriber number (IMSI).

In one embodiment of the invention, the wire-
5 less protocol is used as the protocol of the gateway. Usually the billing is based on a real-time billing that is debited either by transaction or time debiting basis. On the other hand the billing may also be based on the amount of information transferred.

10 In one embodiment of the invention, the database is placed on the control server. Typically, the database is placed in the SDP node of the intelligent network or the internal database of the prepaid service node. The different definitions of the subscriber,
15 such as the access point definition, are made in the home location register. Also other information related to the subscriber may be saved to the database.

For implementing the system of the prepaid service, a set of components of the mobile communica-
20 tion system are needed. First, one will need a mobile communication network to which there is connected a mobile station. The service node connected to the mobile communication network establishes a connection between the service and the mobile communication net-
25 work. In one advantageous embodiment of the invention, the service node consists of a gateway GPRS support node and a serving GPRS support node. Further, to the service node there is connected a control server for monitoring the traffic. To the database attached to
30 the control server, billing information is saved.

The system needed to implement the service in accordance with the invention consists of an access point attribute, control and update unit. The access point attribute is used to point out the service node
35 via which it is possible to use the prepaid service. The control unit is used to monitor the data communication between the mobile station and the prepaid

service, and the prepaid balance of the mobile station is checked from the billing database. The update unit is used to update the prepaid balance of the mobile station in the database based on the use of the data

5   service.

In one embodiment of the invention, the system comprises barring facilities for barring the use of the prepaid service, if there is not enough balance for using the prepaid service.

10   Usually as the mobile communication network, a packet-switched radio service is used, instead of which one may use the global system for mobile communication.

In one embodiment of the invention, the con-

15   trol server is integrated with the gateway GPRS support node.

The present invention enables one to implement the prepaid service in a packet-switched mobile network by adding a few components to the existing

20   telecommunication network. The system in accordance with the invention works also in roaming. The implementation of the invention does not require any specific functionality of the serving GPRS support node of the roaming network.

25

BRIEF DESCRIPTION OF THE DRAWINGS

In the following section, the invention will be described by the aid of the attached examples of its embodiments with reference to the accompanying

30   drawing, in which

Fig. 2 illustrates one system in accordance with the invention,

Fig. 3 represents one flow diagram illustrating the method of the invention,

35   Fig. 4 represents one signaling diagram in accordance with the invention for setting up and setting down a service connection,

Fig. 5 represents one signaling diagram in accordance with the invention for implementing the access right of the prepaid service, and

Fig. 6 represents one signaling diagram in accordance with the invention for implementing an Internet service.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 2 represents one system in accordance with the invention. As the mobile communication network MCN, the global system for mobile communication (GSM) is usually used, in which there is implemented a general packet radio service (GPRS). The radio service comprises at least a service node SN which consists of a serving GPRS support node SGSN and gateway GPRS support node GGSN. The telecommunication connection is established from the mobile station via the base station BS and base station control BSC to the mobile communication network MCN. Further, a telecommunication connection is established from the mobile communication network MCN to the content server CS providing the service via the service node SN and the control server IMS. Information of the use of the service is gathered to the database DB attached to the control server IMS. The mobile communication network comprises also a mobile services switching center MSC and a home location register HLR. In one embodiment of the invention, the access point name definition APN is placed into the home location register HLR. In another embodiment of the invention, a control unit CU and an update unit UU of the database DB are arranged in the control server.

Fig. 3 represents one diagram illustrating the method of the invention. The figure shows the gathering of the billing information to the database DB. At first, from the mobile station MS there is established a connection to the digital service, which

is usually located in the content server CS, block 31.
Next, the data communication to be transferred by way
of the connection is monitored using the control
server IMS, block 32. To the database DB there is
5   saved billing information of the data communication,
examples of which are e.g. connection time and the
amount of information to be transferred using the con-
nection, block 33.

Fig. 4 represents one signaling diagram in
10 accordance with the invention. In the figure there is
set up and set down a connection from the serving GPRS
support node SGSN to the wireless application protocol
gateway node WAP-GW via the gateway GPRS support node
GGSN. The connection is activated by sending an acti-
15 vation request from the serving GPRS support node SGSN
to the wireless application protocol gateway node WAP-
GW via the gateway GPRS support node GGSN. After the
use of the service, the connection is set down by
sending a request for set-down from the serving GPRS
20 support node SGSN to the wireless application protocol
gateway node WAP-GW via the gateway GPRS support node
GGSN. Further, in the figure there is drafted a corre-
lation between the Internet IP address and the MSISDN
or IMSI. Usually, the subscriber databases function
25 based on the MSISDN or IMSI. The correlation between
the IP address and the MSISDN or IMSI is necessary be-
cause the gateway node of the wireless application
protocol WAP-GW sees only the IP address in the pack-
ets received by it and not the subscriber number
30 MSISDN or IMSI.

Fig. 5 represents one signaling diagram in
accordance with the invention. In the invention there
is set up and set down a connection from the serving
GPRS support node SGSN to the content server CS via
35 the control server IMS. The balance information is
checked from the control server IMS and updated in the
database DB when necessary.

At first there is transmitted an activation request from the serving GPRS support node SGSN to the gateway GPRS support node GGSN, from which there is sent an activation of the context to the control
5   server IMS, blocks 50 and 51. The control server IMS checks the balance of the prepaid service of the sub-scriber from the database DB, block 52. Next, the gateway GPRS support node GGSN starts to transmit a WAP enquiry via the control server IMS to the content
10 server CS, if according to the database DB, the sub-scriber can be granted the access to the service, blocks 53 and 54. The content server CS implements the digital service in accordance with the WAP enquiry and sends a response to it, blocks 55 and 56. Further, the
15 connection is set down by sending a request for set-down from the serving GPRS support node SGSN to the content server CS via the gateway GPRS support node GGSN and control server IMS, blocks 57 and 58. At the request for set-down, the content server CS sends a
20 message to update the prepaid balance to the database DB and a message to release the context to the gateway GPRS support node GGSN, blocks 59 and 510. The billing may be implemented either by transaction basis or by applying the time debiting. The figure shows an exam-
25 ple of the time debiting.

When the context is activated, the MSISDN/IMSI information may be transmitted to the ap-plication protocol gateway node WAP-GW, e.g. via a ra-dius protocol. Correspondingly, notification of the
30 release of the context may be transmitted using the radius protocol. In one embodiment of the invention it is possible to find out, using the radius protocol, from the gateway GPRS support node GGSN when a prepaid type of context is activated and when it is released.
35 The control server IMS receives the information using the radius protocol and sees to that the prepaid data-base DB is updated.

Fig. 6 represents one signaling diagram in accordance with the invention. The diagram shows the establishing of a telecommunication connection between the serving GPRS support node SGSN and the content

5   server CS. At first, an activation request of connection is sent via the gateway GPRS support node GGSN to the control server IMS, from which the subscriber´s prepaid balance in the billing database DB is checked, blocks 60, 61 and 62. If the subscriber is granted the

10   access to the service, then packets as defined in the Internet protocol are sent between the serving GPRS support node SGSN, gateway GPRS support node GGSN, control server IMS and content server CS, blocks 63-68. When one stops the use of the service, a request

15   for release is sent from the serving GPRS support node SGSN to the content server CS, after which the costs resulting from the use of the service are deducted from the subscriber´s balance in the prepaid database DB, blocks 69, 610 and 611.

20   In one embodiment as shown in Fig. 6, the prepaid balance of the subscriber is actively updated during the connection. If it is found out that the subscriber´s prepaid balance is running out, the control server IMS stops transmitting the IP packets or

25   sends to the gateway GPRS support node GGSN a request to terminate the connection.

In one embodiment as shown in Fig. 6, the prepaid service has been integrated with the gateway GPRS support node GGSN. In the gateway GPRS support

30   node GGSN there is also implemented a time-based billing based on the amount of information transferred. It is also possible to implement in the gateway GPRS support node GGSN a transaction-based billing when necessary.

35   The invention is not restricted merely to the examples of its embodiments referred to above, instead

many variations are possible within the scope of the inventive idea defined by the claims.

CLAIMS

1. A method for implementing a prepaid serv-
ice in a packet-switched mobile communication network
(MCN), in which method the mobile station (MS) is de-
5   livered the information requested by it as long as
there is prepaid balance left.
     c h a r a c t e r i z e d in that the method fur-
ther comprises the steps of:
     defining the access point name definition which
10   points to the gateway GPRS support node (GGSN) via
which it is possible to use the prepaid service;
     monitoring the traffic between the mobile station
(MS) and the content server (CS) by means of a control
server (IMS) after there was the access point name
15   definition mentioned in the activation request of the
data service sent from the mobile station (MS), which
monitoring proceeds as long as the aforementioned data
service is active, and
     updating the prepaid service balance in the bill-
20   ing database (DB) based on the monitoring of the con-
trol server (IMS).
     2. The method according to claim 1, c h a r -
a c t e r i z e d in that the access point name defini-
tion is arranged in the home location register.
25   3. The method according to claim 1 or 2,
c h a r a c t e r i z e d in that prior to the monitor-
ing of the traffic between the mobile station (MS) and
the content server (CS),
     the balance of the prepaid service is checked from
30 the billing database (DB); and
     the use of the prepaid service is barred, if the
prepaid balance in the billing database (DB) is not
sufficient for using the service.
     4. The method according to claim 1, 2 or 3,
35   c h a r a c t e r i z e d in that during the monitoring
of the traffic between the mobile station (MS) and the
content server (CS),

15

the balance of the prepaid service is checked from the billing database (DB); and

the use of the prepaid service is barred, if the prepaid balance in the billing database (DB) is not

5 sufficient for using the service.

5. The method according the claim 1, 2, 3 or 4, c h a r a c t e r i z e d in that the use of the prepaid service is barred by stopping the transmitting of the packets to be sent to the mobile station (MS).

10 6. The method according to claim 1, 2, 3, 4 or 5, c h a r a c t e r i z e d in that the use of the prepaid service is barred by sending a message to the gateway GPRS support node (GGSN).

7. The method according to claim 1, 2, 3, 4,

15 5 or 6, c h a r a c t e r i z e d in that the billing database (DB) is updated by attributing the follow-up information based on the subscriber number (MSISDN).

8. The method according to claim 1, 2, 3, 4, 5, 6 or 7, c h a r a c t e r i z e d in that the bill-

20 ing database (DB) is updated by attributing the follow-up information based on the subscriber number (IMSI).

9. The method according to claim 1, 2, 3, 4, 5, 6, 7 or 8, c h a r a c t e r i z e d in that the

25 wireless application protocol is used in the connection.

10. The method according to claim 1, 2, 3, 4, 5, 6, 7, 8 or 9, c h a r a c t e r i z e d in that a real-time billing is arranged in the control server

30 (IMS).

11. The method according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, c h a r a c t e r i z e d in that a transaction-based billing is arranged in the control server (IMS).

35 12. The method according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11, c h a r a c t e r i z e d in

that a time debiting-based billing is arranged in the
control server (IMS).

13. The method according to claim 1, 2, 3, 4,
5, 6, 7, 8, 9, 10, 11 or 12, c h a r a c t e r i z e d
5　in that a billing based on the amount of information
transferred is arranged in the control server (IMS).

14. The method according to claim 1, 2, 3, 4,
5, 6, 7, 8, 9, 10, 11, 12 or 13, c h a r a c t e r -
i z e d in that the database (DB) is placed on the
10　control server (IMS).

15. The method according to claim 1, 2, 3, 4,
5, 6, 7, 8, 9, 10, 11, 12, 13 or 14, c h a r a c -
t e r i z e d in that the database (DB) is placed in
the SDP node of the intelligent network.

15　　　　16. A system for implementing a prepaid serv-
ice in a packet-switched mobile communication network,
in which system the mobile station (MS) is delivered
the information requested by it as long as there is
prepaid balance left, which system comprises:
20　　　　a mobile communication network (MCN);

a mobile station (MS) which is connected to the
mobile communication network (MCN);

a service node (SN) which is connected to the mo-
bile communication network (MCN);
25　　　　a content server (CS) from which there is a con-
nection to the service node (SN)

a control server (IMS) from which there is a con-
nection to the service node (SN); and

a billing database (DB) to which billing informa-
30　tion is saved and which is connected to the control
server (IMS),

c h a r a c t e r i z e d in that the system fur-
ther comprises:

an access point attribute (APN) which points to
35　the service node (SN) via which it is possible to use
the prepaid service;

a control unit (CU) which is used to monitor the data communication between the mobile station and the prepaid service and which is used to check the prepaid balance of the mobile station from the billing data-
5   base (DB); and

an update unit (UU) which is used to update the prepaid balance of the mobile station in the database (DB) based on the use of the data service.

17. The system according to claim 16,
10   c h a r a c t e r i z e d   in that the system further comprises barring facilities for barring the use of the prepaid service.

18. The system according to claim 16 or 17, c h a r a c t e r i z e d   in that as the packet-
15   switched mobile communication network (MCN), the gen- eral packet radio service is used.

19. The system according to claim 16, 17 or 18, c h a r a c t e r i z e d   in that as the packet- switched mobile communication network (MCN), the
20   global system for mobile communication is used.

20. The system according to claim 16, 17, 18 or 19, c h a r a c t e r i z e d   in that the service node (SN) consists of a gateway GPRS support node (GGSN) and serving GPRS support node (SGSN).

25   21. The system according to claim 17, 18, 19 or 20, c h a r a c t e r i z e d   in that the control server (IMS) has been integrated with the gateway GPRS support node (GGSN).
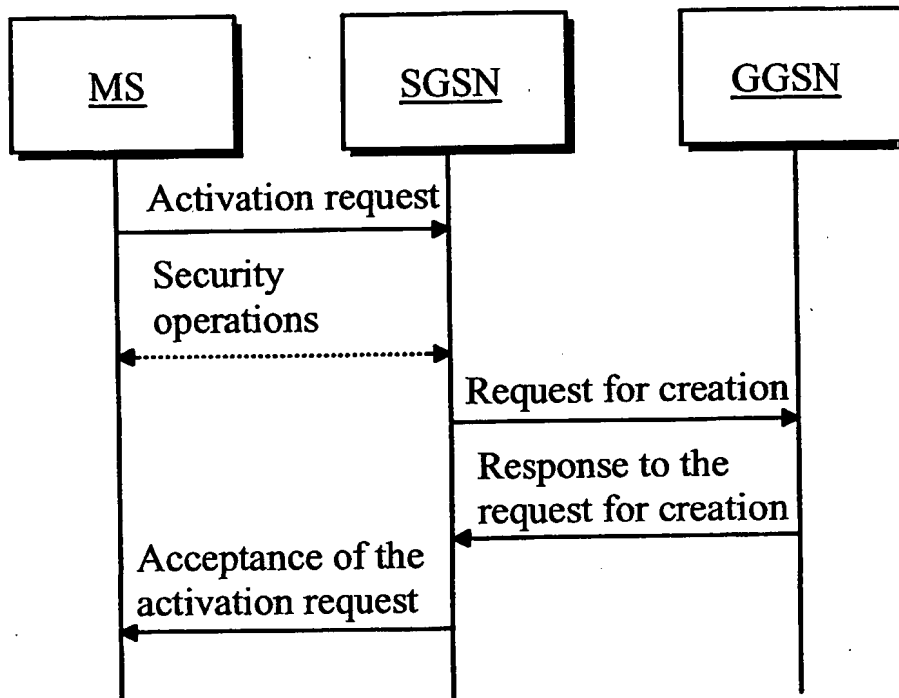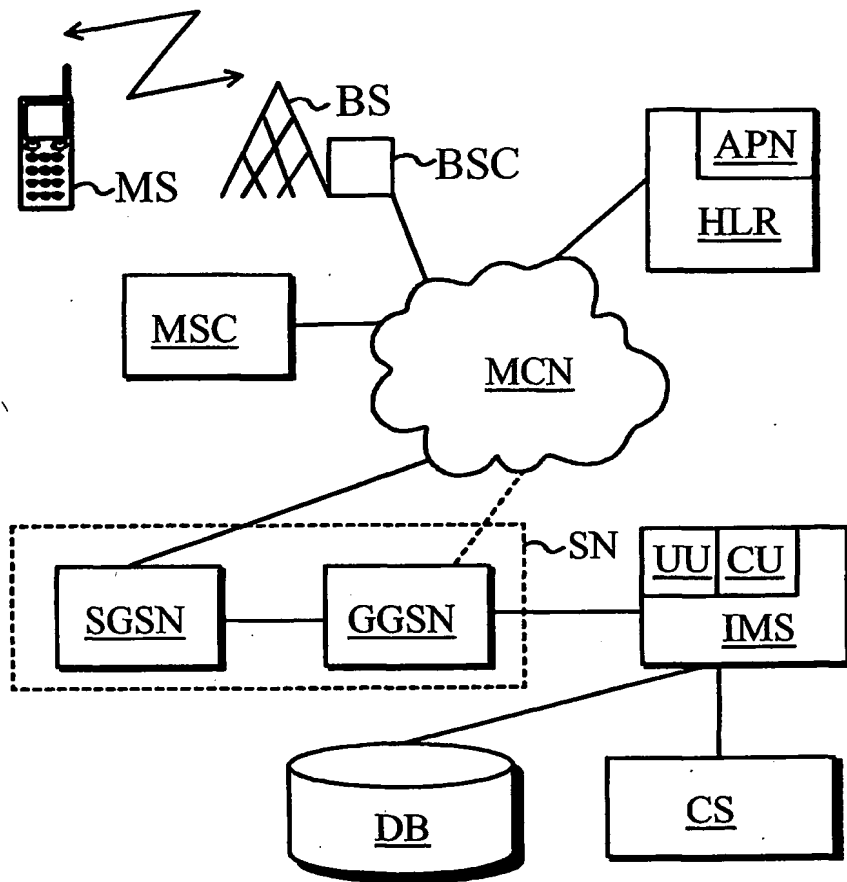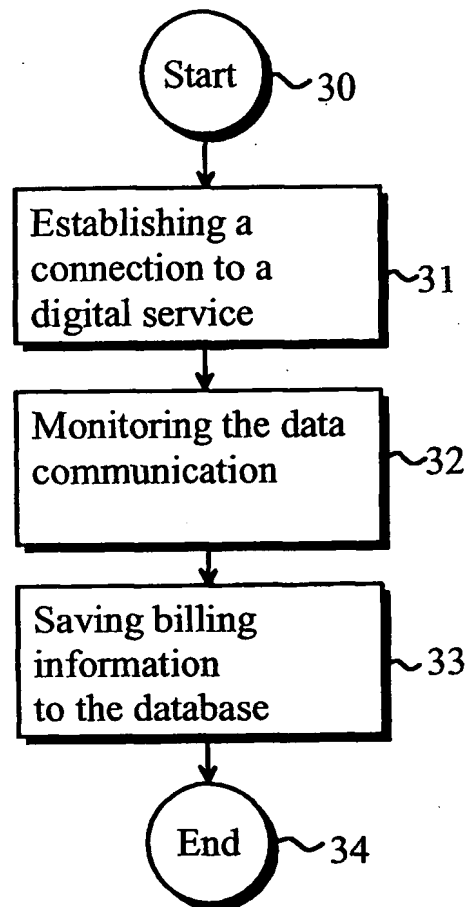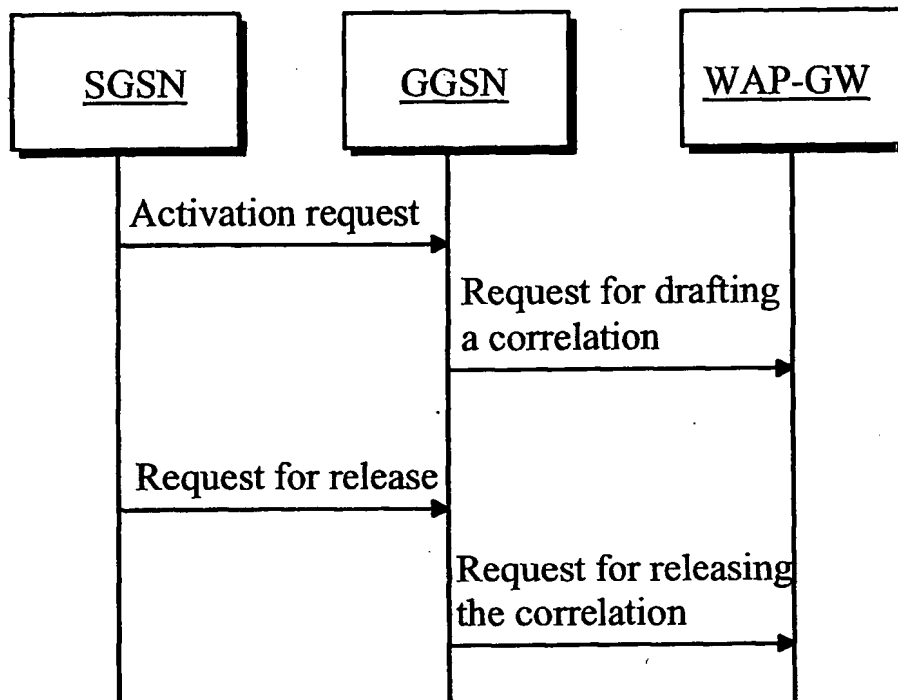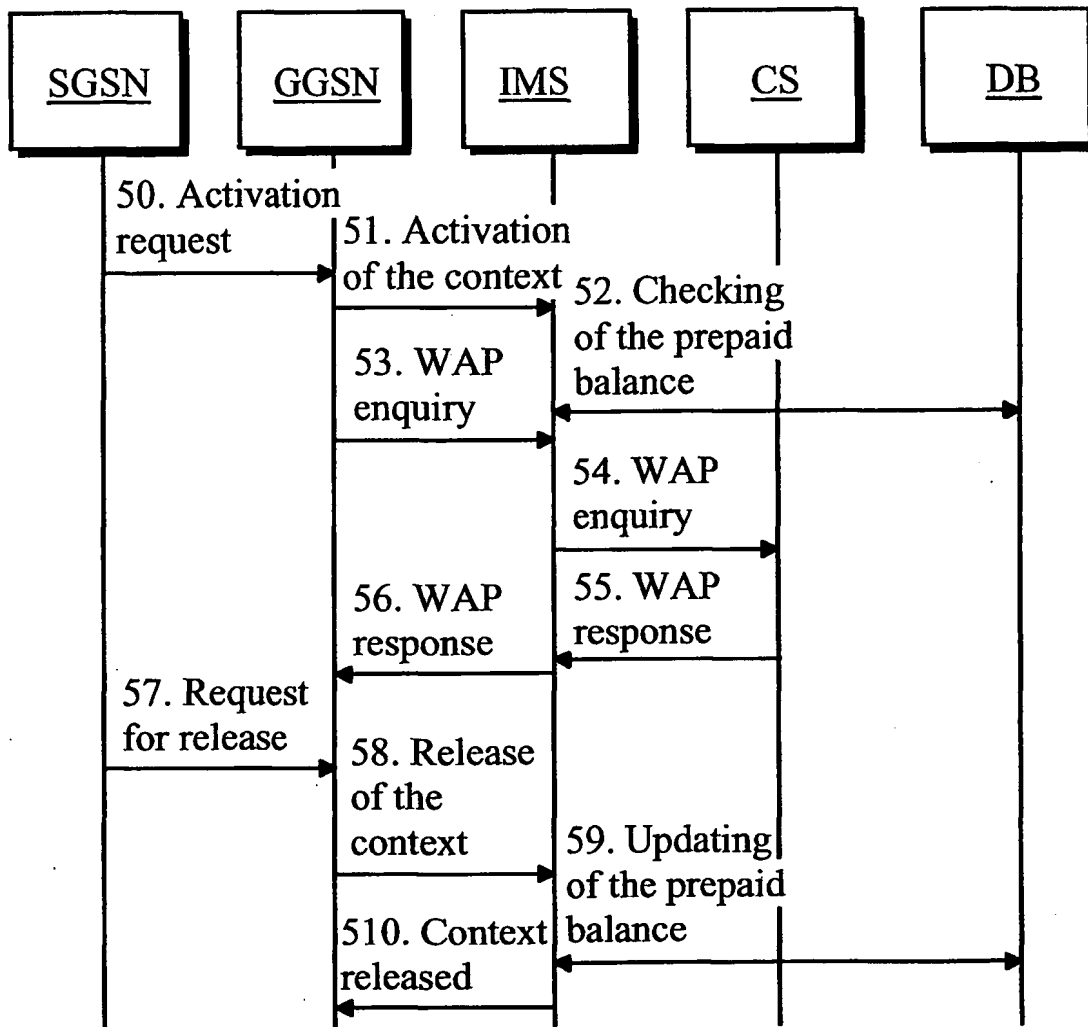
Prior Art

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5
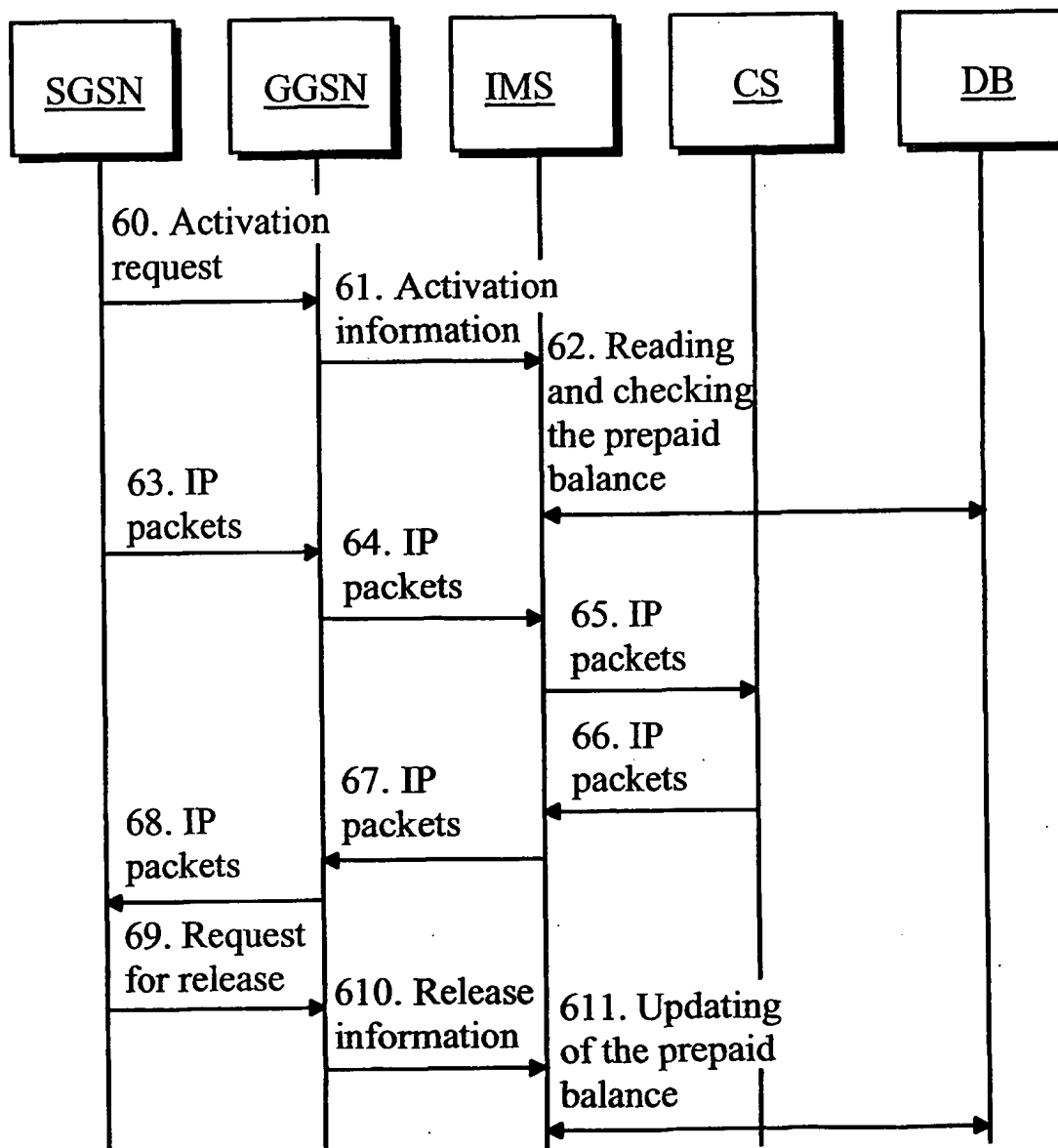
Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 01/00716

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04M 17/00, H04Q 7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0024161 A1 (NOKIA NETWORKS OY), 27 April 2000 (27.04.00), page 2, line 18 - page 11, line 33, figure 1, claim 7, abstract	1-21
P,X	WO 0069118 A1 (TELEFOAKTIEBOLAGET LM ERICSSON (PUBL9), 16 November 2000 (16.11.00), page 2, line 30 - page 4, line 31, figures 1,2,7, abstract	1-21
X	US 5854975 A (FOUGNIES ET AL), 29 December 1998 (29.12.98), column 3, line 50 - column 4, line 56; column 9, line 8 - line 25, figure 1, abstract	1-21

[X] Further documents are listed in the continuation of Box C.   [X] See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 December 2001	1 2 -12- 2001

Name and mailing address of the ISA/	Authorized officer
Swedish Patent Office	
Box 5055, S-102 42 STOCKHOLM	Elisabet Aselius/js
Facsimile No. +46 8 666 02 86	Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

International application No.

PCT/FI 01/00716

	C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9916262 A1 (MCI WORLDCOM INC.), 1 April 1999 (01.04.99), figures 1-2, abstract --	1-21
X	WO 9916281 A1 (MIC WORLDCOM, INC), 1 April 1999 (01.04.99), page 3, line 14 - page 5, line 6, figures 1-2, abstract -- --------	1-21

International application No.

PCT/FI 01/00716

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	0024161	A1	27/04/00	AU 6343999 A		08/05/00
				EP 1123606 A		16/08/01
				FI 982263 D		00/00/00
				FI 982748 A		20/04/00
WO	0069118	A1	16/11/00	AU 4789500 A		21/11/00
US	5854975	A	29/12/98	US 5722067 A		24/02/98
				US 6157823 A		05/12/00
				US 6236851 B		22/05/01
				US 2001021648 A		13/09/01
WO	9916262	A1	01/04/99	AU 9497898 A		12/04/99
				EP 1020090 A		19/07/00
				US 6075982 A		13/06/00
				US 2001018337 A		30/08/01
WO	9916281	A1	01/04/99	AU 9662398 A		12/04/99
				EP 1018281 A		12/07/00
				US 6292656 B		18/09/01